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Tree farming guidelines

4th Edition (2022)

Part 1 - Forest management

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TREE FARMING GUIDELINES

4th edition (2022)

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PART 1 - FOREST MANAGEMENT

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Foreword

The first edition of Tree Farming Guidelines was published in 1997, followed by revisions in 2004 and 2010. This is the fourth edition, incorporating the latest developments in sustainable forest management. The purpose is to provide a practical guide to tree farming for Sappi's private timber suppliers.

Sappi Forests
Pietermaritzburg
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2022

CHAPTER 1 - INVESTING IN FORESTRY

The decision to invest in forestry is complex and should, like any investment opportunity, be thoroughly researched. As this represents a long-term investment, the length of the investment period requires prudent financial planning.

The industry has developed financial models to determine the viability of any forestry project. These models indicate the risks and returns on the investment as well as provide interim valuations of the growing stock for insurance purposes.

Compared with several agricultural products, timber has over time proved to be a very stable and financially worthwhile investment. Over the past thirty years, new expansions were done by small and medium forestry enterprises, and they have become major role players in the timber industry.

The diversity of products from plantation forestry are ever increasing. Timber is one of the few renewable resources in the world and will always be a sought-after product.

Rod McLeod

There is in forestry probably less chance of a man finding himself in the wrong niche than most occupations, as he is unlikely to take up the work in the first instance without a real aptitude for it, and these people seem to absorb some of nature's own serenity and sense of proportion.

It is a lonely life and I imagine few townsfolk could face the silence, but to those men who know and love trees any other existence is unthinkable.

(K Cowin in Bushveld, Bananas and Bounty. Michael Joseph, London 1954)

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CHAPTER 2 – PLANNING Page

Management is the ability to accomplish work through others. The aim of planning should be to force people to think, examine and try to understand the future, which is, of course, uncertain and unpredictable. Planning helps managers make decisions about strategic changes, rather than produce a rigid plan[9].

Planning need not be a complicated process, but it requires clear objectives, imagination, and a willingness to consider all points of view having relevance to a given situation. An element of flexibility is necessary in order to cope with unforeseen events which could affect the achievement of objectives[2].

1. Strategic planning

Strategic planning is traditionally conducted to make decisions about sustainable harvest levels while considering legislation and policy issues[1].

The strategic plan should include:

- A clear vision of the future forestry landscape you are working toward.
- A clear understanding of the issues and challenges.
- A set of values that express what you believe in, provides guidelines for how you work and is the basis of what you are trying to achieve.
- A clear mission statement.
- A clear identification of outputs, outcomes and short-, medium- and long-term impacts[7].

2. Tactical (long-term) planning

Within the frame of the strategic plan, the purpose of the tactical plan is to schedule forestry operations in the immediate years. The volume targets that need to be achieved are normally the input to the tactical plan from the strategic plan. A major objective is to ensure that equipment will be fully utilized and that human resources are catered for[5].

A five-year harvesting plan is an example of a tactical plan. The harvest schedule is further refined by consolidating areas to be harvested in the same year. Harvesting systems to be applied in each area are evaluated in terms of physically possible application, economically feasibility, environmentally and silvicultural acceptability e.g., post harvesting activities required to accommodate re-establishment[3].

3. Operational (short-term) planning

The annual plan of operations (APO) is a management tool that turns a strategy into implementation and action[7]. The time scale for operational planning is one year or less[1]. The APO does not only prescribe the work schedule for the current year but must report on activities undertaken in the previous operational year and incorporate activities that must be carried over[4].

Operational planning must address a wide range of needs, issues, and challenges, availability of resources as well as a diversity of interests. Thus, assigning priorities to various activities is very important during planning. To help identify priorities, questions can be asked about the timing of activities. For example:

- Which activity needs to be completed before others can be initiated? E.g., land preparation must be done before planting.
- Some activities should be done during certain times of the year, e.g., planting during the rainy season; fire-break preparation before the dry season, etc.
- Which activities are easier, faster, and cheaper to implement?
- Which activities are key to achieve the strategic goals?

A critical step during operational planning is to identify both the resources (human, technical, financial, equipment, etc.) you require, the resources you have available and to balance these two[7].

Once the operational plan is complete it should be reviewed for completeness, clarity, sufficiency, currency, flexibility, and sustainability[7].

3.1 Benefits of operational planning

- Ensures that individuals work towards organisational objectives to achieve expected outcomes.
- Moves away from crisis management to sensible planning.
- Is proactive and identifies potential problems and opportunities in advance and takes appropriate action.
- Encourages managers to think analytically, evaluate all alternatives and improve decision making.
- Assists managers in understanding their responsibilities and those of their subordinates.
- Encourages involvement which strengthens commitment to organisational objectives.
- Saves time, energy, and resources in the long run.
- Provides a basis for holding people accountable.
- Provides a basis for measuring progress and doing regular monitoring.
- Provides an understanding of what is and is not possible.
- Provides a basis for budgeting. Refer to Annexure 5 for an example of a basic budget.
- Assesses risk factors and develops mitigation strategies[6, 7].
- Ensures continuity especially where personnel are transferred or resign.
- Becomes a permanent record of planned work.
- Forms the basis for further planning[8].

3.2 Elements of a good operational plan

- What must be done?
- When and how long will it take?
- The plan must specify the sequence in which work is to be done and what methods, techniques, procedures, materials, and equipment should be used, i.e., how will it be done?
- It must identify the people responsible for achieving the objectives as well as their authority and control over resources, i.e., who will be involved? [6]

- The plan must be relatively simple to be understood by all involved.
- The plan must be flexible to cope with unforeseen changes[8].

3.3 Target setting

The setting of targets is the most important element of the planning process as it provides direction for the business and the individual employees. It also serves as a basis for allocating resources, controlling performance and establishing reward structures. Targets that are measurable, realistic, challenging, and worthwhile instil a sense of urgency and meaningfulness among staff and lead to increased productivity.

Other benefits of target setting:

- people gain clarity about their job, roles, and responsibilities.
- it can foster good communication between managers and subordinates[6].

3.4 Subdivisions of the APO

When a complicated situation must be planned or analysed it is advisable to divide it into smaller independent parts, which can be analysed or planned separately. Thereafter the parts can be combined to obtain the total picture. E.g., the budget or APO can be divided into subdivisions such as silviculture, harvesting and administration. Each of these subdivisions can then be further divided into different activities or elements, e.g., silviculture can be subdivided into land clearing, planting, blanking, etc.

In practice codes or cost centres are usually allocated to each of these elements to simplify planning and control; and to enable integration within the cost accounting system. The more intensive the subdivision the more intensive planning, budgeting and control can be done. However, a too detailed subdivision will make planning clumsy, complicated, and unmanageable[8].

3.5 Suggested process for the execution of the APO

From the long-term plans the total work volume for the specific annual plan should be determined per activity. Several activities can be derived from the silviculture plan, such as soil preparation, planting, blanking, road maintenance, etc. The fire protection plan will indicate which fire breaks need attention and the conservation plan will indicate which open areas need burning or noxious weed control. During this stage it is important to refer to the previous year's APO to identify work that was planned but not completed as well as work that must be followed up on (i.e., previous weed control, planting, pitting, etc.).

The work then must be divided amongst the different teams or contractors to ensure each team have a full year's workload. Thereafter the work of each team should be allocated to a specific time of the year. Here it is important to identify the time-dependent activities and to prioritize activities. All the essential (high priority) and time-dependent activities should be allocated to time periods first. The time independent and continuous (low priority) activities can be used to balance man-days required by the work volume of each team on a monthly basis and for the whole year. This process is called phasing.

A Gantt chart is a valuable technique to do phasing. It consists of a matrix with a calendar as horizontal axis and a list of tasks or activities on the vertical axis (Figure 1). The duration of the task is shown as a horizontal line. This can be easily done on a computer, graph paper or white board.

Activity		Number days	Month											
			Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Disaster clear		**241**	23	21	22	22	21	15	15	20	23	18	20	21
Pitting		**200**	23	21	22	22	21	15	15	20	23	18		
Chemcial weeding (pre-plant)		**104**			22	22	10	10	10	10	10	10		
Planting window														
	Pines	**112**					21	15	15	20	23	18		
	Eucs low altitude	**86**				22	21			20	23			
	Eucs high altitude	**93**				22	21	15	15	20				
Chemical weeding (maintenance)		**60**						10	10	10	10	10	10	

Figure 1: Example of a Gantt chart that indicates the duration of each activity as well as the number of workdays associated with each activity per month (e.g., chemical weeding may only be possible on 10 workdays/month due to unfavourable weather conditions during the rainy season (November to April)).

After the distribution of each team's work over the year, the next step is to do more intensive planning for a period of two to three months. Specific work is scheduled according to compartment numbers, areas, and work norms for specific weeks with the operational plan as basis. This phase requires co-ordination between harvesting and silviculture. The two-to-three-month plan can be used as the basis to do daily planning with the contractor or supervisor during regular meetings[8].

Continuous daily, monthly, and year-end review of progress against the plan (in terms of costs and activities) is an important function of management. The daily production sheet which indicates the number of worker units and area completed enables actual productivity to be measured against the plan. This forms the heart of the control on a plantation as these are summarised to draw up a weekly and monthly progress report[8].

4. References

[1] Andersson, D., 2005: Approaches to integrated strategic/tactical forest planning. Licentiate thesis. Swedish University of Agricultural Sciences. Umeå. Sweden.

[2] Armitage, I., 1998: Guidelines for the management of tropical forests. 1. The production of wood. Chapter 3. Guidelines for forest management planning. FAO forestry paper 135. Food and Agricultural Organization of the United Nations, Rome. Retrieved on 31/7/2013 from www.fao.org/docrep/w8212e/w8212e07.htm.

[3] Brink, M.P., Kellogg, L.D. and Warkotsch, P.W., 1995: Harvesting and transport planning – a holistic approach. Southern African Forestry Journal 172: 41-47.

[4] FDA, 2007: Guidelines for forest management planning. Forestry Development Authority, Monrovia, Liberia. Retrieved on 30/07/2013 from www.fda.gov.lr.

[5] FEW, 1998: Environmental Management: Achieving results with forest engineering knowledge. Workshop Notes. Forest Engineering Workshop, University of Stellenbosch, South Africa.

[6] Hudson Crane, 1997: Performance improvement team training manual. SAFCOL. Nelspruit.

[7] IMFNS, 2008: Framework for model forest annual work planning. International Model Forest Network Secretariat, Canada. Retrieved on 31/7/2013 from www.imfn.net.

[8] Louw, W.J.A., 2000: Annual Planning of Operations. Section 4.8 in Owen, D., (ed.) South African Forestry Handbook. South African Institute of Forestry, Pretoria.

[9] Thompson, J.L., 1993: Strategic management. Awareness and Change. Second Edition. Chapman and Hall, London.

CHAPTER 3 - GROWTH & YIELD

Planning and scheduling of timber yields should be in place for the development of an optimal harvesting strategy.

1. Measuring growth and yield

1.1 Site index (SI)

Site index is defined as the dominant tree height for a specific species at a set reference age. At Sappi Forests, the reference age for hardwood species is 5 years and for softwoods 15.

Site index is the primary driver of volume projection in a growth and yield model database. Refer to figures 1 and 2. E.g., for *E. dunni*, at an age of 5 years the dominant height can vary from 12 to 21m depending on the site quality.

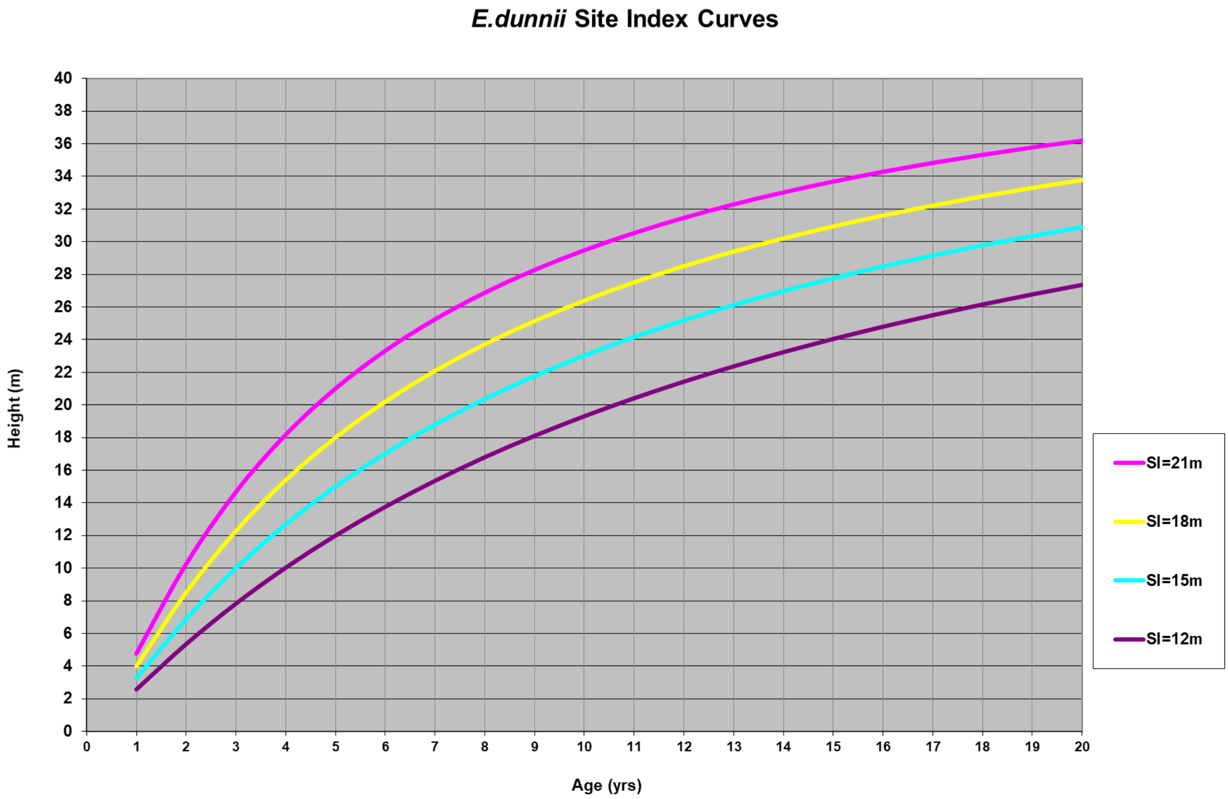

Figure 1: Example of site index curve for *E. dunnii*

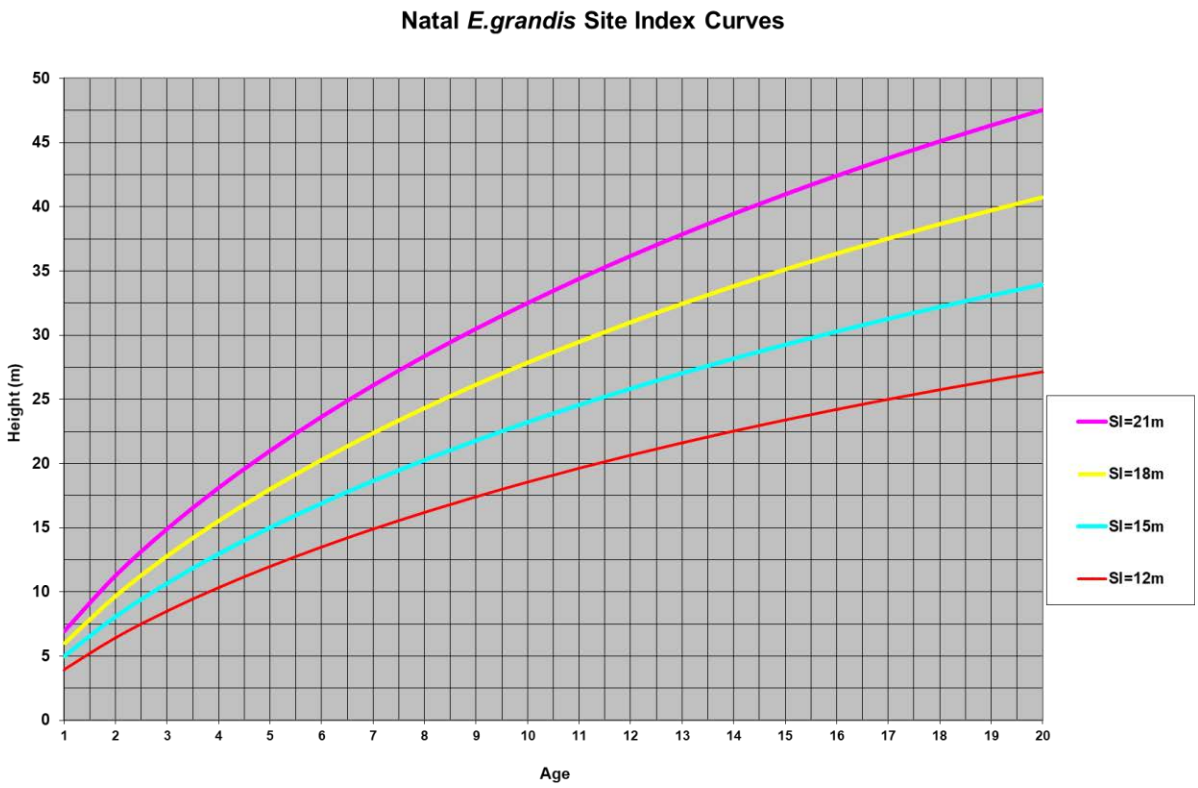

Figure 2: Example of site index curve for *E. grandis*

1.2 Site quality (SQ)

Site quality is defined as the growth production potential for a specific species on a given growing site.

This can be directly assessed by tree measurements, or indirectly from either lesser vegetation characteristics, or from topographic, soil or climatic factors. [1] Refer to Table 1 below. [2] [3] E.g., for *E. nitens* growing on Site Quality 1 (the best site), the site index (the dominant height) can vary from 18.1 to more than 21m.

2010	SQI	SQII	SQIII	SQIV	SQV
E. grandis MPU (-Venus)	24.1->27.0	21.1-24.0	18.1-21.0	15.1-18.0	<12.1-15.0
E. grandis Zululand Coast	21.1->-24.0	18.1-21.0	15.1-18.0	12.1-15.0	<9.1-12.0
E. grandis KZN (+Venus)	23.1->-26.0	20.1-23.0	17.1-20.0	14.1-17.0	<11.1-14.0
E. grandis x camaldulensis	24.1->27.0	21.1-24.0	18.1.21.0	15.1-21.0	<12.1-15.0
E. nitens	18.1->21.0	15.1-18.0	12.1-15.0	9.1-12.0	<6.1-9.0
E. dunnii	21.1->-24.0	18.1-21.0	15.1-18.0	12.1-15.0	<9.1-12.0
E. smithii	22.1->25.0	19.1-22.0	16.1-19.0	13.1.16.0	<10.1-13.0
P. patula	25.1->28.0	22.1-25.0	19.1-22.0	16.1-19.0	<13.1-16.0

P. elliottii	23.1->26.0	20.1-23.0	17.1-20.0	14.1-17.0	<11.1-14.0
A. mearnsii	23.1->28.0	22.1-25.0	19.1-22.0	16.1-19.0	<13.1-16.0

Table 1: Relationship between Site quality and Site index[2, 3]

1.3 Mean annual increment (MAI)

Mean annual increment is defined as the growth (expressed in tons or m³) per hectare per year at a given reference age. It is influenced by site quality and climate and differs from one species to another.

MAI is used to determine the production potential of a compartment at a given age, e.g., the planned tons = planted hectares x tree age x MAI. Refer Tables 2 and 3.[4] E.g., on average for *E. nitens* in KZN at a site index (dominant height) of 20m, the growth could amount to 23 tons per ha per year.

UTILIZABLE MAI (TONS) BY SI AND SPECIES:KZN										
Site Index	Utilizable MAI (tons) with felling									
	Amea	Edun	Egra	Egxc	Egxu	Enit	Esmi	Pell	Ppat	Ptae
10	6	7	4	3	6	8	4	10	0	4
11	7	8	5	3	7	10	6	10	0	4
12	8	9	6	4	8	11	7	10	0	5
13	9	11	7	5	9	12	9	10	3	6
14	10	12	9	7	10	13	10	11	5	7
15	11	14	10	8	12	15	12	11	7	9
16	12	15	12	9	13	16	14	12	9	10
17	13	17	14	11	15	18	16	13	11	11
18	15	19	16	12	17	20	18	14	13	13
19	16	21	17	14	19	22	20	15	15	15
20	17	22	19	16	22	23	22	16	16	16
21	18	24	21	18	25	25	24	18	18	18
22	20	26	24	20	27	27	27	19	19	20
23	21	29	26	22	30	29	29	21	20	22
24	22	31	28	25	34	32	32	23	21	24
25	24	33	30	27	37	34	34	25	22	27
26	25	35	33	30	41	36	37	27	23	29
27	27	38	35	33	45	39	40	30	24	32
28	28	40	38	35	49	41	43	32	25	34
29	30	43	40	38	53	44	46	35	25	37
30	31	45	43	41	58	46	49	38	26	40
Reference age for SI:Pines =15 years, Eucs & Amea= 5years										
Data source:Sappi Enumeration data										

Table 2: Utilisable MAI tons (KZN)

UTILIZABLE MAI (TONS) BY SI AND SPECIES:MPU								
Site Index	Utilizable MAI (tons) with felling							
	Edun	Egra	Emac	Enit	Pech	Pell	Ppat	Ptae
10	9	4	8	8	0	4	5	3
11	9	4	9	9	0	5	5	4
12	10	5	10	10	0	6	6	5
13	11	5	11	11	0	7	7	6
14	11	6	13	13	2	8	8	8
15	12	7	15	14	4	10	9	9
16	14	8	18	16	7	11	9	11
17	15	9	21	18	9	12	10	12
18	16	11	24	19	11	14	11	14
19	17	12	27	21	13	15	12	16
20	19	14	31	23	15	17	14	18
21	21	15	35	25	16	18	15	20
22	22	17	40	27	17	20	16	22
23	24	19	44	30	18	22	17	24
24	26	21	49	32	18	23	18	26
25	28	23	55	34	19	25	20	29
26	30	25	60	37	19	27	21	31
27	32	28	66	39	19	29	22	34
28	35	30	73	42	18	31	24	36
29	37	33	79	45	18	33	25	39
30	40	35	86	48	17	35	27	42
Reference age for SI:Pines =15 years, Eucs & Amea= 5years								
Data source:Sappi Enumeration data								

Table 3: Utilisable MAI tons (MPU)

1.4 Basal area (BA)

Basal area indicates the total area per hectare (in m²) of all trees, measuring their diameter at a breast height of 1.3m. Figures 3 and 4 display the relationship between basal area and dominant tree height.

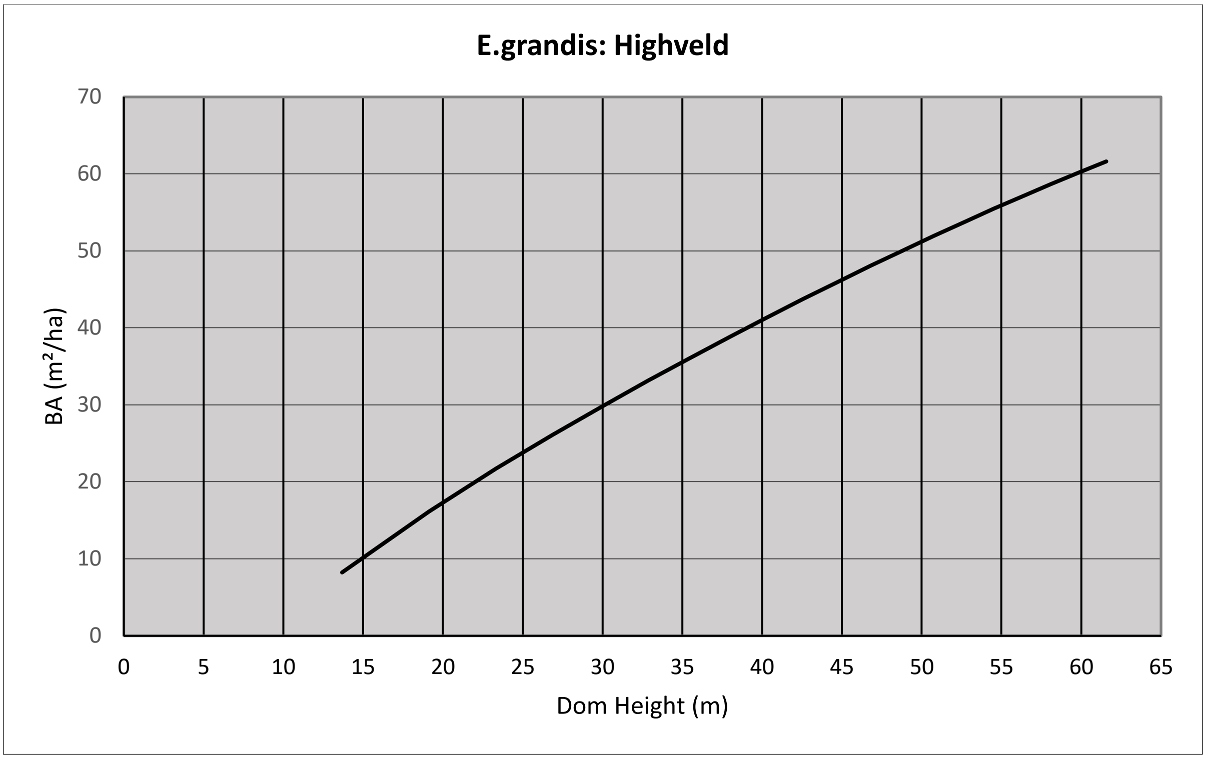

Figure 3: BA/dominant height graph (*E. grandis*)

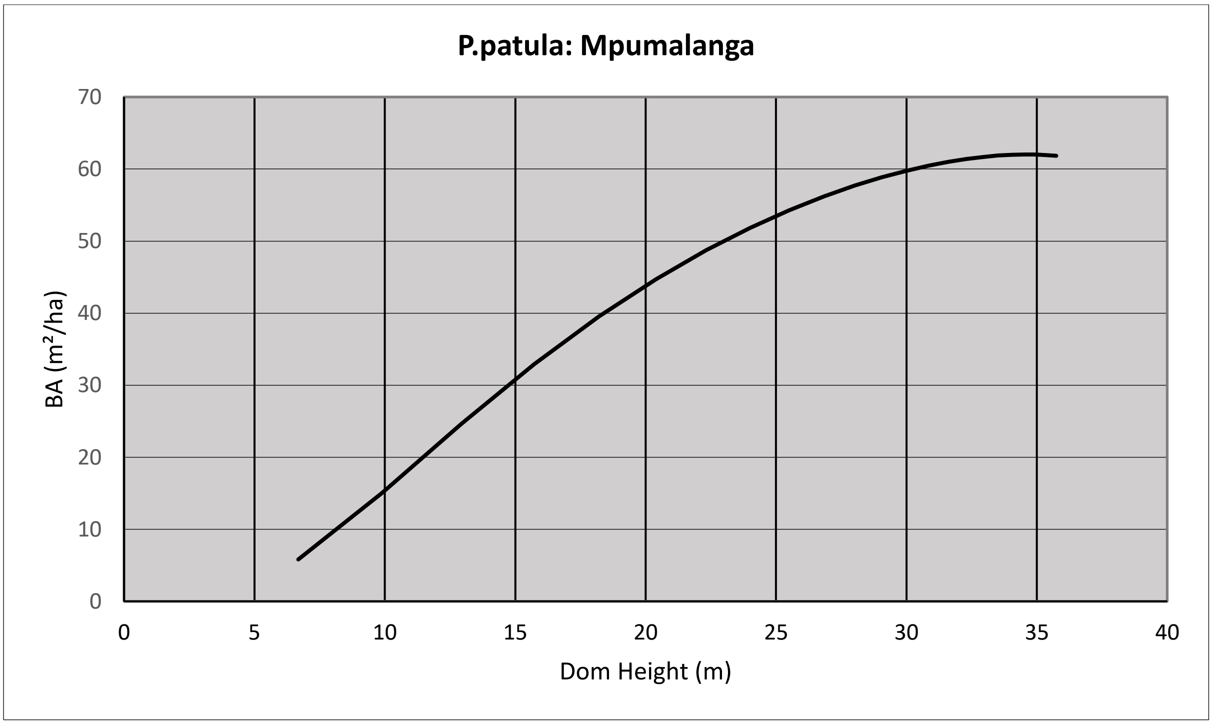

Figure 4: BA/dominant height graph (*P. patula*)

1.5 Conversion factor

At Sappi Forests mass is determined at the weighbridge of the receiving mill. The unit of sale is “wwt” (wet white tons). A standardised conversion table is used to determine the relationship between mass and volume (refer Table 4).

Species	wwt/m³	m³/wwt
A. mearnsii	0.87222	1.14650
E. dunnii	0.87719	1.14000
E. grandis	0.71429	1.40000
E. gxc	0.71429	1.40000
E. gxu	0.751	1.33
E. macarthurii	0.87719	1.14000
E. nitens	0.87719	1.14000
E. smithii	0.87719	1.14000
P. elliottii	0.92336	1.08300
P. greggii	0.92336	1.08300
P. patula	0.87108	1.14800
P. taeda	0.85712	1.16670

Table 4: Conversion factors[3]

2. Maintaining sustainable yields

Sustainability of timber supply should be the main aim of any tree farmer. This does not only refer to harvesting, but also to re-establishment. The planting APO should dovetail with the felling schedule to ensure continuity. Timing, market demand and product type play a major role in this regard.

2.1 Simple method

1. Annual felling area = total planted area / felling age
2. Annual felling tons = total planted area x MAI

This method is suitable where growing conditions are uniform but has limited use in proper harvest planning.

2.2 Bucket fill method

Sappi Forests uses this method extensively for long-term harvest planning. This simulation involves timber harvesting followed by immediate planting. The planned fell year represents a “bucket”, and each bucket is filled with volumes from available compartments. The availability of compartments depends on product, age, and market demand.

3. Rotation length

Rotation can be defined as the period in years between establishment of a stand of timber and the time when it is considered ready for final harvest.

The *biologically* optimal rotation age coincides with the age when the Mean Annual Increment (MAI) peaks (Figure 5).

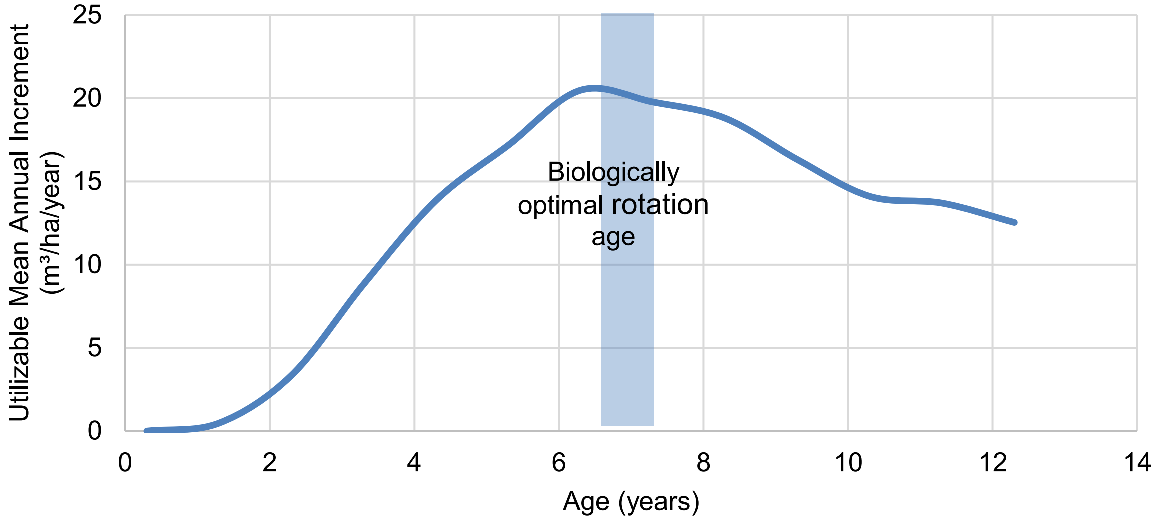

Figure 5: Relationship between age and utilizable MAI (m³/ha/year) for *Eucalyptus* in KwaZulu-Natal. The blue shaded area indicates the biologically optimal rotation age.

The *economically* optimum rotation age is the age when the harvesting will generate the maximum economic yield, i.e., when the Net Present Value (NPV) peaks. Thus, rotation age is a function of harvesting, timber handling, discount rate, future price, establishment cost, reinvestment options, non-timber products (e.g., carbon storage), and other ecological services.

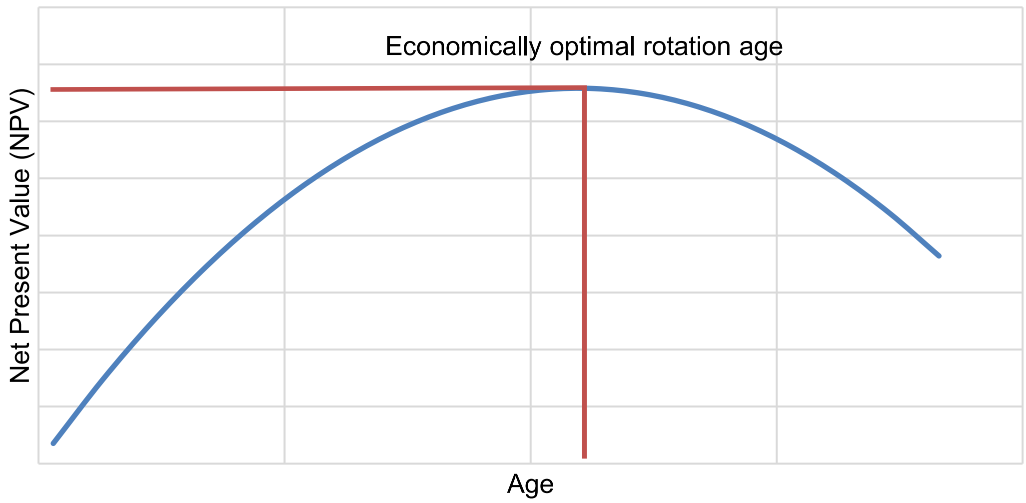

Figure 6: NPV relationship with rotation age. The red line indicates the economically optimum rotation age.

Revenue = Volume × price.
Cost = Cost of harvesting + handling.
Hence, Profit = Revenue – Cost.

The future costs and revenues need to be discounted to present value.
Then NPV = Present Value Revenue – Present Value Costs.

For pulpwood production the rotation age varies between 8 and 14 years for hardwood, and 14 to 23 years for softwood.

4. References

[1] Von Gadow, K & Bredenkamp, B (1992) Forest Management. Academia. JC van Schaik, Pretoria.
[2] Kassier, H (2003) MAI Scheduling by Species. Sappi Forests General Document.
[3] Crous, JW (2010). Site Quality Classification of Forest Land Types and Plantation Blocks for Sappi Land Holdings. Technical Report 06/2010. Sappi Forests, Pietermaritzburg.
[4] Wise, A (2017) updated Kassier, H (2003). Unpublished.

Endangered orchid *Satyrium rhodanthum* at Dungay farm

CHAPTER 4 - ENVIRONMENTAL MANAGEMENT

The impacts of timber plantations on the natural environment can generally be reduced to the following major impacts[1]:

- o the reduction of stream flow in a watercourse;
- o the impact on biodiversity;
- o the impact on ecosystem structure;
- o the impact on soil (soil loss and nutrient status); and
- o the impact on carbon storage.

Negative impacts can be reduced through compliance with the law and the implementation of best management practices resulting in the following positive outcomes[1]:

- o the impacts on stream flow reduction are minimised through the removal of all alien and invasive species from within the wetland buffer zones and the withdrawal of timber plantations from within the wetland buffer zone (a combination of a voluntary initiative/best management practice/legal requirement). Refer to Planting restrictions in Chapter 5 of Part 2 - Silviculture.
- o the impacts on biodiversity are minimised through the retention or establishment of natural vegetation corridors between the timber compartments and the management of such unplanted land for biodiversity conservation and functioning of ecosystem structures (voluntary initiatives); and
- o the impacts on soil, particularly on recently harvested compartment and from roads are reduced through the retention of timber residue on the harvested compartment and the proper construction and maintenance of gravel roads.

Areas not suitable for planting should be managed responsibly with regards to the control of alien invasive plants, fires, and grazing.

Measures to manage grasslands can include[1]:

- o grassland conservation is best achieved through the implementation of a controlled burning programme and low to medium stocking densities of domestic livestock, if at all.
- o burning programmes should be prepared annually with the provision of firebreaks being the priority to minimise the risk of run-away fires later in the winter season.
- o foresters should ensure that there is a mosaic of burnt and unburnt grassland on the estate which encourages the regrowth of palatable grass species postburn and cover for wildlife in the unburnt areas (the so-called “patch mosaic burning”).
- o specific objectives for any grassland should be developed, such as an early winter burn for oribi, or protection of wattled crane nests (in June).
- o extensive annual burning should be avoided where possible, although it may be necessary for the same areas to be burnt annually such as for the protection of timber from fires in high-risk areas (adjoining known high fire danger hot spots), or for firebreaks.
- o grasslands should be planned to be burnt at a frequency of between two to three years; and
- o records of the fire plan should be kept, and notes made on the success or otherwise of the plan in terms of achieving its objectives.

Measures that can be used to burn[1]:

- o fynbos should be burnt in autumn or according to prescriptions set out in a burning plan. A mosaic of irregular burning of between 8 and 20 years is preferable but may be more frequent in certain high fire risk areas.

- o sour grassland should be burnt in winter or early spring (when the grasses are dormant) and should be in response to specified objectives set out in a burning plan. A mosaic of irregular burning every two to three years is preferable.
- o in savannah/sour bushveld, the frequency of burning will depend on the available fuel load and the objectives of the fire plan.
- o invasive plant control operations should precede burning (to reduce the fuel load) but any chemical control measures should take place well in advance of the burn to ensure the efficacy of the active ingredient; and
- o burning of wetlands should be on a biennial (once every two years) rotational basis and timed to avoid the peak breeding seasons of wildlife, particularly those of cranes which breed in the wetlands in winter. Annual burning can also be practiced if it is necessary to reduce the potential impact of unplanned or arson fires on the timber crop.

A Threatened or Protected species (TOPS) checklist has been compiled (Annexure 6) of those species most likely to occur in plantation areas. The National Environmental Management of Biodiversity (NEMBA) Act (No.10 of 2004) provides a listing of TOPS species as published in the Government Gazette.

Regarding the management of waste, the following measures should be used[1]:

- waste should be recycled or disposed of in accordance with the relevant legislation.
- recycling of glass, tins, paper, organic kitchen waste and oil should be promoted and adequately identified containers should be provided by landowners to manage the programme.
- empty agrochemical containers should be returned to the supplier or sent for recycling.
- cognisance should be taken of any provincial or local by-laws on waste management.
- seedling containers should be removed from in-field and returned to the nursery. Broken seedling containers should be disposed of to a registered waste disposal site or sent for recycling.
- organic fertiliser stockpiles should not be placed near natural water sources or near groundwater where water can be contaminated and should be protected from wind dispersal and the breeding of insects and pests (there should be no standing water at the stockpile).
- workshops:
  - o wash-bay facilities should be provided for cleaning tractors and equipment.
  - o all run-offs should be directed into a protected sump to minimise contamination of ground water or water courses.
  - o old engine oil should be emptied into containers and recycled.
  - o all equipment and power supply points should comply with relevant health and safety requirements.

Reference

[1] Environmental Guidelines for Commercial Forestry Plantations in South Africa (2021) 4th edition. Forestry South Africa. https://www.forestrysouthafrica.co.za/2021-environmental-guidelines/

CHAPTER 5 – FOREST CERTIFICATION

During 1998 Sappi Forests developed the Sustainable Fibre Farming Incentive Scheme (SFFIS) to ensure that private growers, contracted to supply timber to Sappi, implement sustainable forest management practices on their land. It was a voluntary scheme whereby participating growers were audited annually. The SFFIS scheme was not accredited but formed part of Sappi's environmental management system.

Subsequently, market demand from Sappi's mills as well as from customers required an accredited system with regards to responsible forest management. This also applied to the forestry practices of private suppliers. Due to increased customer activism, there is an ever-increasing demand for certified timber world-wide. Consumers purchasing a timber product with a certified label are guaranteed that the product originates from a sustainably managed forest. Thus, an accredited Sappi Forests Group Certification scheme, which replaced SFFIS, was developed and implemented.

Forest certification is a process by which an independent body verifies that a plantation is managed according to sustainable forestry standards. These standards consist of principles and criteria which in turn set out the economic, social, and environmental requirements of the standard. This does not imply that the individual plantation owner is prescribed regarding the management of their plantations, but that minimum criteria are to be met in order to archive certification.

The Forest Stewardship Council (FSC®) was set up in 1993 primarily to protect and manage the uncontrolled harvesting of timber from tropical indigenous forests. Certification standards were later expanded to cater for plantation forestry. The Programme for the Endorsement of Forest Certification (PEFC) was founded in 1999 in response to the specific requirements of small and family forest owners, providing assessment, endorsement, and recognition of national forest certification systems. The PEFC and the FSC are the only two fully international forest certification labels.

Membership of a Sappi Forests Group Scheme is voluntary and is open to private growers contracted to Sappi. Prior to acceptance as member, the forest management units of applicants are audited to ensure that basic conditions are met.

Certified timber growers who wish to make a claim about their products must be certified for chain of custody (CoC). CoC is the path taken by products from the forest to the point where the product is sold. It follows the supply chain through processing, manufacturing, and distribution, where progress to the next stage of the chain involves a change of ownership. CoC certification provides a credible assurance that products which are sold with a certified claim originate from sustainably managed forests and controlled sources.

A major benefit of certification to the timber grower is that it provides access to markets. Other advantages include improved risk management, and the discipline of thorough record keeping and the regular analysis of the economic viability of forestry operations.

Know the source – maintain the standards – enjoy the benefits

CHAPTER 6 - HEALTH & SAFETY

Effective, pro-active safety management is good business practice. A safe operation is associated with an efficient operation not only because it reduces the potential for loss, but because it increases production, improves the working environment, and adds to an overall improvement in worker attitude and morale.

The Constitution of South Africa allows every person the right to a safe and healthy environment. In terms of section 24 of the Constitution, every person has the right to an environment that is safe and not harmful to their well-being. At common law, every employer is obliged to take reasonable care for the health and safety of its employees at work. The Occupational Health and Safety Act 85 of 1993 states that every employer shall provide and maintain, as far as is reasonably practicable, a working environment that is safe and without risk to the health of his employees.

Safe work procedures should include the following:

- adequate supervision to ensure that work is conducted safely.
- a trained first aider with a first aid kit on site at all hazardous operations (e.g., harvesting, chemical application).
- a system to restock first aid boxes.
- fire-fighting equipment available and accessible during fire season.
- chainsaw operators to possess a valid chainsaw operator's certificate.

Employees should be provided with personal protective clothing (PPE) appropriate to their assigned tasks.

All relevant employees, as well as contracted employees, should be adequately trained. All legally required machine or vehicle operators, first aiders (at least level 1), chainsaw operators and staff applying chemicals should have skills certificates. Fire-fighting refresher training should be conducted annually.

Identifying risks to health and safety includes three stages:

- Obtaining information
- Risk assessment
- Risk mitigation

These stages can be broken down in steps:

- Step 1: Identify the health and safety risks that the business is exposed to in its operating environment.
- Step 2: Analyze the risks.
- Step 3: Evaluate and rank the risks.
- Step 4: Mitigate the risks.
- Step 5: Monitor and review the risks.

Hazards to the health and safety of forest workers have been identified as per the Risk Assessment - refer to Annexure 1. It includes the factors to mitigate the risks that have been rated as high.

Sappi Forests employ a “Stop & think before you act” principle to safety – refer to Annexures 2 to 4.